Flagging health risks of chemicals by combining in vitro bioactivity data with environmental and consumer product exposure modeling

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testing physiological parameter here is BL intensity. The BL assay systems are based on biological objects of different levels of organization – bacteria-based or enzyme-based bioassays, providing for a study of the effects of toxic compounds on cells or enzymes, respectively. Basing on a broad investigation of effects of model toxic exogenous compounds on BL assay systems, classification of the effects on the BL enzyme reaction was suggested. The effects were classified as physical, chemical and/or biochemical ones. Five mechanisms are discussed: (1) change in electron-excited states' population and energy transfer, (2) change in the efficiency of the S-T conversion in the presence of an external heavy atom, (3) change of rates of coupled reactions, (4) interactions with enzymes and variation of the enzymatic activity, (5) nonspecific effects of electron acceptors. The broad experience in investigation of effects of exogenous compounds makes the BL assay systems to be a very convenient tool for studying toxicity mechanisms. The BL assays were found to be sensitive to alpha- and beta-radionuclides. The role of peroxides and electron transfer in hormesis and toxic effects of radionuclides was studied. Changes in protein secondary structure in bacterial cells exposed to radionuclides was discussed in terms of a stress response of the bacterial cells to the low-dose chronic radioactivity. The mutagenic effect of tritium was studied using restriction analysis of marker amplicons. Detoxification of solutions of metallic salts and organic oxidizers by humic substances (HS), products of natural transformation of organic matter in soils and bottom sediments, was studied. Detoxification mechanisms were revealed to be complex, with chemical, biochemical, and cellular aspects conditioning those. The detoxifying effects were explained by: (i) decrease of free toxic compound' content in water solutions under binding and redox neutralization by HS, (ii) increase of rates of biochemical processes in the bioassay system under HS influence, (iii) enhancement of mucous layers on cell surface as a cellular response to unfavorable impact of toxicants. Mechanisms (ii) and (iii) revealed an active role of the bioassay systems in the detoxification processes.

165 Flagging health risks of chemicals by combining in vitro bioactivity data with environmental and consumer product exposure modeling A.S. Ernstoff, Quantitative Sustainability Assessment; H. Shin, University of California Davis; D.H. Bennett, Public Health Sciences; J.A. Arnot, ARC Arnot Research Consulting / Department of Physical Environmental Science; S.A. Csiszar, University of Toronto / Dept of Chemical Engineering and Applied Chemistry; P. Fantke, Technical University of Denmark / IER; B.A. Wetmore, The Hamner Institutes for Health Sciences / Institute for Chemical Safety Sciences; O. Jolliet, University of Michigan / School of Public Health. Combining *in vitro* bioactivity data with exposure models is essential to predict potential public health risks. We present a tier 1 framework to flag chemical exposures of potential risk based on *in vitro* bioactivity data for 229 chemicals from the US EPA. To understand chemical-specific exposure, we refined thousands of chemical categories in the US EPA ACToR/CpCat product database to harmonize with exposure modeling. Most chemicals matched several of the following exposure categories: direct intakes (e.g. food), dermal application (e.g. cosmetics), pesticides (e.g. ingestion of residues), and indoor and environmental emissions. Results were also cross-checked with the Household Product Database and FDA-approved food additives. We independently estimated population-scale chemical intake fractions due to environmental and indoor emissions and product intake fractions using three multi-media models (USEtox, CalTox, RAIDAR). Model results predicted similar trends within two orders of magnitude for most chemicals. Intake fractions were multiplied by emission estimates or production volumes to extrapolate daily intake of chemical per unit bodyweight (mg/kg/day). Modeled intake doses per category varied greatly across chemicals due to physicochemical properties and emission estimates - the main source of uncertainty. We found using conservative approaches, that chemical intake due to consumer product use generally exceeds intakes due to environmental exposures, with the greatest intake being 2,600mg/kg/day for phenol in a personal care product. Population-scale average intake doses due to environmental exposures were always less than 0.34 (mg/kg/day). When comparing intake estimates with the bioactivity data, we found 66 chemicals with a maximum intake that exceeds the minimum oral dose equivalents for observed biological activity. For these 66 chemicals there were several chemical/exposure classification combination that exceeded min oral dose equivalents: 12 cases due to environmental exposure, 20 cases due to product use within home, 41 cases due to personal care product, and 47 cases due to food ingestion. These chemical exposures are flagged as needing to be further evaluated in order to understand possible public health threats.

166 Second tier options in the EFSA Guidance Document on Risk Assessment of Plant protection products on bees (Apis mellifera, Bombus spp. and solitary bees) C. Szentes, EFSA; F. Streissl, EFSA / Pesticide Unit; D. Auteri, Auteri; R. Sharp, EFSA European Food Safety Authority. Pesticides are considered as one factor among others that are contributing to the decline of pollinators. Moreover, the current risk assessment schemes for pesticides are not considered to be able to address the risk to pollinators in a comprehensive way. This indicated the need to review the current risk assessment schemes and to develop new, more sophisticated ones. As a response to this regulatory challenge, the European Commission tasked EFSA to develop guidance for pesticide risk assessment for bees. The new guidance document was issued on July, 2013, but has not yet been adopted for use in regulatory risk assessments. The guidance document suggests the implementation of a tiered risk assessment scheme with a simple and cost-effective first tier moving to more complex higher tiers (e.g. using field studies). Each tier of the risk assessment ensures that the appropriate level of protection is achieved. However, the guidance document was heavily criticised by different stakeholders including the industry and some European regulatory bodies. One of the main concerns raised by the industry was the severity of the first tier together with the unfeasibility of the highest tier options. However, there has been very little discussion regarding the 2nd tier options, which is between the 1st tier and highest tier level. A number of 2nd tier options are suggested by the guidance document which can be used to refine the estimation of the exposure of pollinators to pesticides when foraging on the treated plants. These options can also be used to provide a more realistic oral exposure estimate for larvae. Crop or compound specific data are needed at this tier, with which a low risk may be achieved. Consequently, there will be no need to perform the more complex and expensive field studies. As an example, it is expected that using compound specific information on residue levels in pollen and nectar will provide a solution in many cases. For other cases data on the sugar content of the nectar will be sufficient. The presentation will deliver an overview of the most important 2nd tier options that are included in the guidance document. Also, a case study will be presented explaining how some of these options can be applied in practice.

167 Development of a Toxicokinetic-Model of the Bee Hive. K. Szonn, RWTH Aachen University / Institute for Environmental Research; C.D. Maus; H. Ratte, Research Institute for Ecosystem Analysis and Assessment – gaiac; M. Ross-Nickoll, RWTH Aachen / Institute for Environmental Research; W. Schmitt, Bayer CropScience AG / Environmental Modelling; T.G. Preuss, Bayer CropScience / Institute for Environmental Research. Pollination is an important factor of the food economy and the honey bee *Apis mellifera* is the most important commercial pollinator. Over the last few years, potential effects of insecticides on bee colonies have been discussed. There is largely consensus that the risk assessment for bees will benefit from a deeper understanding of mechanisms of bee exposure to pesticides. To understand the effects of toxicants in the bee hive it is important to fully understand their fate within bee colonies. Literature data were analysed to determine the relevant toxicokinetic processes in the bee colony and how these processes influence the fate of chemical substances in the bee hive. To realistically estimate the quantity of chemical substances bees are exposed to within the hive, the whole process of resource collection and processing has to be taken into account. We assume bee-to-bee-contact as the most important factor for the distribution of chemical substances in the hive; physicochemical properties of the materials in